Life Support Systems: Carbon Dioxide Removal

Active Technology Project (2014 - 2024)

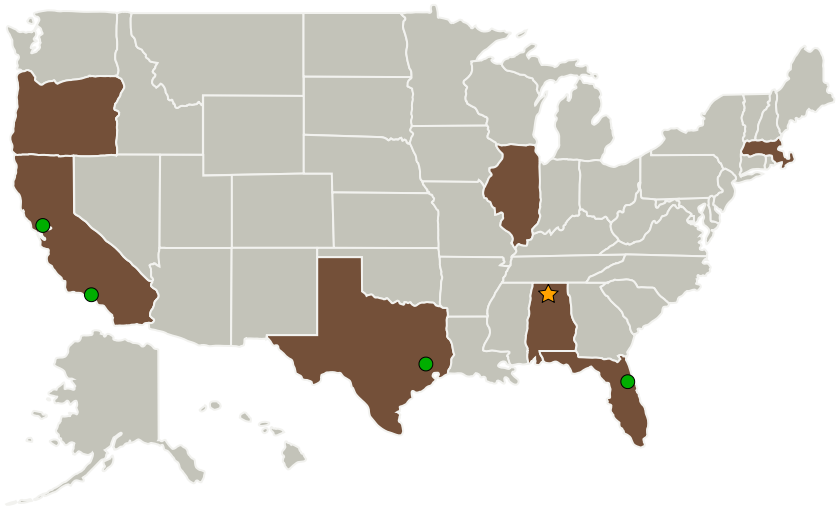
Project Introduction

The Advanced Exploration Systems (AES) Life Support Systems project Carbon Dioxide Removal and Management task includes development of systems that remove CO_2 from a crewed cabin and manage the flow rate of removed CO_2 to a downstream CO_2 reduction system. In general, the goal of these efforts is to develop systems and component technologies that will become International Space Station (ISS) flight demonstrations. Here the ISS will provide the platform for long-term system testing in a relevant environment, thus enabling the evaluation and certification of the technology candidates for future missions. The project is developing a technology that uses IntraMicron sorbent to replace the current clay bound sorbents. The structured sorbent will resolve dust generation issues seen with the clay bound sorbents used on the ISS. The project is also developing a liquid amine technology to remove CO_2 as a replacement technology for CO_2 removal using sorbents. Another technology is using Metal Organic Frameworks (MOF) to fabricate a highly efficient CO_2 removal system with high stability based on zeolite and MOF monoliths.

Anticipated Benefits

Maintaining low CO_2 levels is critical for astronaut health. These technology developments may provide the function of removing CO_2 with a system different from the state-of-the art that could potentially be more reliable and require less resources to operate.

Primary U.S. Work Locations and Key Partners



Advanced Exploration Systems Life Support Systems Logo

Table of Contents

Life Support Systems: Carbon Dioxide Removal

Active Technology Project (2014 - 2024)

Organizations Performing Work	Role	Type	Location
★Marshall Space Flight Center(MSFC)	Lead Organization	NASA Center	Huntsville, Alabama
●Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California
Giner Electrochemical Systems, LLC	Supporting Organization	Industry	Newton, Massachusetts
Honeywell International	Supporting Organization	Industry	
Jacobs Engineering Group, Inc.	Supporting Organization	Industry	Dallas, Texas
●Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California
●Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas
JSC Engineering, Technical, and Science(JETS)	Supporting Organization	Industry	Texas
●Kennedy Space Center(KSC)	Supporting Organization	NASA Center	Kennedy Space Center, Florida

Continued on following page.

Organizational Responsibility

Responsible Mission Directorate:

Exploration Systems Development Mission Directorate (ESDMD)

Lead Center / Facility:

Marshall Space Flight Center (MSFC)

Responsible Program:

Exploration Capabilities

Project Management

Program Director:

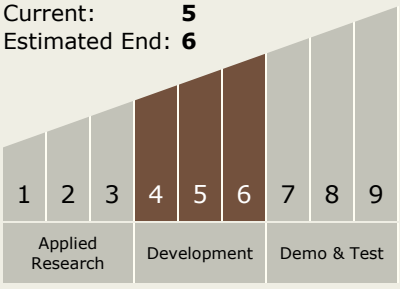
Christopher L Moore

Project Manager:

Walter F Schneider

Technology Maturity (TRL)

Start: **4**
Current: **5**
Estimated End: **6**



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Organizations Performing Work	Role	Type	Location
Portland State University	Supporting Organization	Academia Alaska Native and Native Hawaiian Serving Institutions (ANNH), Asian American Native American Pacific Islander (AANAPISI)	Portland, Oregon
Precision Combustion, Inc.	Supporting Organization	Industry	North Haven, Connecticut
Wyle Laboratories, Inc.	Supporting Organization	Industry	

Primary U.S. Work Locations	
Alabama	California
Florida	Illinois
Massachusetts	Oregon
Texas	

Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.1 Environmental Control & Life Support Systems (ECLSS) and Habitation Systems
    - TX06.1.1 Atmosphere Revitalization

Target Destinations

The Moon, Mars, Others Inside the Solar System

Supported Mission Type

Projected Mission (Pull)

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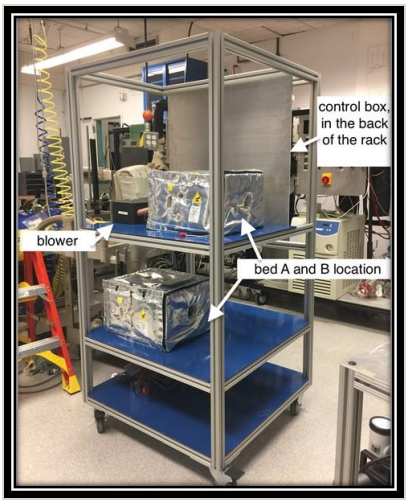
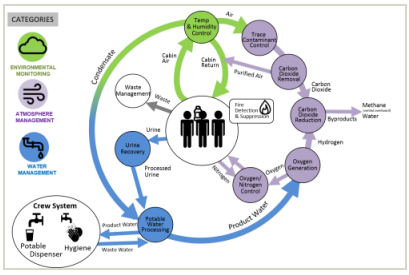
Images

Advanced Exploration Systems Life Support Systems
Advanced Exporation Systems Life Support Systems Logo
(https://techport.nasa.gov/image/143443)



Air Cooled-Temperature Swing and Compression
Air Cooled-Temperature Swing and Compression hardware design to compress carbon dioxide
(https://techport.nasa.gov/image/143444)



ECLSS Loop Closure Cycle
ECLSS Loop Closure Cycle
(https://techport.nasa.gov/image/143441)